BEFORE THE
WASHINGTON UTILITIES AND TRANSPORATION
COMMISSION

In the Matter of the Review of:)
Unbundled Loop and Switching Rates;   )
the Deaveraged Zone Rate Structure; and)
Unbundled Network Elements,   )   DOCKET NO. UT–023003
Transport, and Termination   )
)
)

JOINT DIRECT TESTIMONY OF

JOSEPH GILLAN

AND

RICHARD CHANDLER

ON BEHALF OF

AT&T COMMUNICATIONS OF THE PACIFIC NORTHWEST, INC.,
AND WORLDCOM, INC.

June 26, 2003

1 **I. INTRODUCTION**

2 **Q. Please state your names, business addresses and occupations.**

3 A. Our names are Joseph Gillan and Richard Chandler. Mr. Gillan's business address

4 is P.O. Box 541038, Orlando, Florida 32854. Mr. Gillan is an economist with a

5 consulting practice specializing in telecommunications. Mr. Chandler is a Senior

6 Vice President of HAI Consulting, Inc., with a business address of 1355 S.

7 Boulder Road, #184, Louisville, Colorado 80027.

8

9 **Q. Please briefly summarize Mr. Gillan's educational background and related**

10 **experience.**

11 A. Mr. Gillan is a graduate of the University of Wyoming and holds B.A. and M.A.

12 degrees in economics. From 1980 to 1985, Mr. Gillan was on the staff of the

13 Illinois Commerce Commission where he had responsibility for the policy

14 analysis of issues created by the emergence of competition in regulated markets,

15 in particular the telecommunications industry. In 1985, Mr. Gillan left the

16 Commission to join U.S. Switch, a venture firm organized to develop

17 interexchange access networks in partnership with independent local telephone

18 companies. At the end of 1986, Mr. Gillan resigned his position as Vice

19 President-Marketing/Strategic Planning to begin a consulting practice. Over the

20 past twenty years, Mr. Gillan has provided testimony before more than 35 state

21 commissions, five state legislatures, the Commerce Committee of the United

22 States Senate, and the Federal/State Joint Board on Separations Reform. Mr.

1   Gillan currently serves on the Advisory Council to New Mexico State University's

2   Center for Regulation.

3

4   **Q.   Please summarize Mr. Chandler's background and experience.**

5   A.   Mr. Chandler holds BSEE and MSEE degrees from the University of Missouri

6   and an MBA from the University of Denver. Mr. Chandler has also completed

7   additional graduate study in electrical engineering at the University of Colorado,

8   and worked as an electronic engineer at the Institute for Telecommunication

9   Sciences studying microwave and optical propagation and analyzing radar

10   systems. Mr. Chandler worked at Bell Laboratories in the exploratory and

11   advanced development of customer switching systems. While at Bell Labs, Mr.

12   Chandler worked extensively on packet switching and circuit switching

13   technologies. Mr. Chandler transferred to AT&T, where he was a product

14   manager working on, among other things, product strategies for advanced circuit

15   and packet switching systems. After working at AT&T, Mr. Chandler joined a

16   startup mobile satellite company as vice president of network engineering. In that

17   role, Mr. Chandler developed the ground system network architecture, which

18   included switching and signaling functions, for the proposed system.

19

20   At HAI (and its predecessor, Hatfield Associates, Inc.), Mr. Chandler has been the

21   principal developer of the Hatfield/HAI cost models. In addition, Mr. Chandler

22   has analyzed a range of telecommunications technologies and systems for a

1   number of clients. Many of these investigations have involved the study of packet

2   switching technologies. Mr. Chandler has also taught graduate-level

3   telecommunications technology courses in digital switching, including circuit and

4   packet switching, basic telephony, and cellular and wireless communications, at

5   the University of Colorado, the University of Denver, and Pace University.

6

7   **Q.**   **On whose behalf are you testifying?**

8   A.   We are testifying on behalf of AT&T Communications of the Mountain States,

9   Inc. ("AT&T") and WorldCom, Inc ("MCI"). Although sponsored by these two

10   companies, our perspective is that of consultants, each of whom has been actively

11   involved in the technical and economic evolution of the telecommunications

12   industry for 20 years.

13

14   **Q.**   **What is the purpose of your testimony?**

15   A.   The purpose of our testimony is to explain, from an economic and engineering

16   perspective, why it is appropriate for the Commission to adopt a flat-rate structure

17   for the unbundled local switching network element. Such a structure would

18   recover the cost of unbundled local switching entirely through its port charge,

19   with no separate rate for usage. As we demonstrate below, the usage-based

20   pricing of local switching is an anachronism, traceable to pricing and

21   technological circumstances than no longer exist.

22

1   The unbundled local switching (ULS) network element is far different than the

2   types of switching "services" that state commissions have reviewed in the past.

3   Traditional switching cost models have attempted to "allocate" the cost of the

4   local switch to the various services (such as local, access and calling features) that

5   use this facility. When a CLEC leases the ULS network element, however, it

6   purchases the ability to offer all of these services, no different than the incumbent

7   when it purchases the switch from the manufacturer. Just as Qwest purchases its

8   switching capacity from vendors paying a flat-rate, entrants should lease capacity

9   in these same switches from Qwest under a flat-rate structure.[1]

10

11   Moreover, the underlying cost structure of a modern switching system has

12   changed over the years as advances in microelectronics have essentially rendered

13   usage irrelevant as a design constraint. Unlike prior generations, best-in-class

14   modern circuit switches, such as the Lucent 5ESS and Nortel DMS-100, are

15   designed to reach capacity limits based on the number of lines connected to these

16   switches, not the usage through them. As a result, forward-looking engineering

17   principles support the elimination of a separate usage charge on CLECs leasing

18   local switching UNEs.

19

---

[1]   Although the testimony refers only to Qwest, we believe that the engineering, pricing, and technical conclusions apply equally to Verizon (or any other ILEC for that matter). As such, the Commission should understand our testimony to apply generally to unbundled local switching, even though much of it is styled as applying to Qwest.

1   **II.   THE ULS NETWORK ELEMENT AND LEGACY COST MODELS**

2   **Q.   Please describe the ULS network element.**

3   A.   The ULS network element represents the lease of switching capacity on a per-port

4   basis to an entrant. The ULS network element enables multiple carriers to offer

5   exchange services, proportionally sharing the switching facility according to the

6   number of line ports leased to each carrier (or used by the incumbent). For each

7   port leased by an entrant, the entrant obtains the right to access all of the local

8   switch port's features, functions and capabilities:

9   [A] carrier that purchases the unbundled local switching element to
10   serve an end user effectively obtains *the exclusive right* to provide
11   all features, functions, and capabilities of the switch, including
12   switching for exchange access and local exchange service, for that
13   end user.[2]

14   In effect, the ULS network element provides its purchaser a "lock, stock and

15   barrel" ability to provide *all* services to its end-users' lines, treating the capacity

16   and potential of the switch as a common resource to be used by multiple exchange

17   carriers.

18

---

[2]   *Implementation of the Local Competition Provisions of the Telecommunications Act of 1996*, CC Docket No. 96-98, Order on Reconsideration, 11 FCC Rcd 13042, ¶11 (1996), *aff'd in part and remanded, AT&T v. Iowa Utils. Bd.*, 119 S. Ct. 721 (1997), *aff'd, Implementation of the Local Competition Provisions of the Telecommunications Act of 1996*, CC Docket No. 96-98, Third Report and Order and Fourth Further Notice of Proposed Rulemaking, FCC 99-238, ¶ 245 (rel. Nov. 5, 1999).

1   Q.   **Is this a different perspective on the "local switch" than that typically**

2   **underlying the traditional ILEC cost modeling?**

3   A.   Yes. The ULS network element is a significant departure from the traditional

4   view of a local switch as a "multi-product" investment. As a multi-product

5   investment, ILECs have historically been interested in estimating the cost of

6   *individual* switch uses (such as access, toll or a specific optional feature) so that a

7   price for each of these "partial" uses could be established. The usage sensitive

8   pricing of local switching stems from this traditional perspective that "every use

9   must have its own cost, so that every use may have its own price."

10

11   The Commission can easily appreciate the difficulty, however, of trying to

12   apportion switch investment among different uses, so that distinct retail prices

13   could be justified. This task resulted in ILEC-sponsored switching cost models

14   that became quite complex, with a predisposition towards using usage as a means

15   to allocate cost, whether or not there was a causal link.

16

17   Q.   **Are legacy cost models "biased" by this retail orientation (and the**

18   **incumbents' desire to assign costs to particular services?**

19   A.   Yes. The "granddaddy" of switching cost modeling is the Switching Cost

20   Information System ("SCIS") model developed by BellCore (now Telcordia).

21   SCIS was developed in the 1970s to estimate the cost of (then new) optional

22   features and services that were being introduced by local telephone companies.

1   Although Qwest does not use SCIS, the US WEST "equivalent" model

2   (developed in the mid-1980's) was based on the same overall approach, and is

3   similarly designed to allocate switching investment to services and features.

4

5   Given the problem that these models were intended to solve – i.e., how to

6   apportion common investment among individual features and functions of a

7   switch – it should be expected that the initial architects would rely heavily on

8   "relative use" as a way to allocate investment. Such a relative-use perspective

9   leads to (i.e., rationalizes) the allocation of switching resources among different

10   uses.[3]

11

12   Q.   **What design theory did the cost-modelers invoke to justify using usage to**

13   **allocate the cost of the switch to different services?**

14   A.   To justify allocating cost based on "usage," ILEC cost models adopted the

15   *assumption* that switch-processor and other "getting started" costs are driven by

16   usage (as opposed to the number of lines and trunks connected to the switch).[4]

17   This step was based on the view that a switch would reach capacity because of

18   usage, and therefore would need to be replaced due to "usage-based" exhaust. By

---

[3]   For instance, the basic SCIS documentation makes clear that a primary motivation in the design of that model was to treat costs as usage-related. According to Bellcore itself, SCIS was developed to meet four objectives, including the objective that *"...cost results would be based on usage."* (Switching Cost Information System, Bellcore Description, page 3).   Said directly, the cost model produced a usage-cost because its architects preordained the result – a design goal for the model was a result that portrayed switching cost as a usage-sensitive investment.

[4]   In blunt terms, the easiest way to *establish* causality is to *assume* causality.

1   this "logic," the fixed costs of a new switch could be "attributed" to usage.

2   Armed with this assumption, cost models were developed that tried to "reverse-

3   engineer" the switch price from the manufacturer (that was *not* based on usage) to

4   determine how the manufacturer's price *might* have varied, had switches capable

5   of accommodating different traffic requirements been purchased.[5] Of course, this

6   logic (for lack of a better term) completely breaks down if the predicate – that

7   switches plausibly exhaust based on usage – is false.

8

9   **III.   THE BASIC ARCHITECTURE OF A MODERN CIRCUIT SWITCH**

10   **Q.   Please describe the basic architecture of a modern circuit switch.**

11   A.   Switching system architectures are generally organized into three functional

12   divisions: control structure, switching network (sometimes referred to as the

13   switching "fabric" or "matrix"), and "periphery." The periphery is where lines

14   and trunks are connected to the switch. In their early implementations a few

15   decades ago, stored-program-controlled switches were usage-limited – that is, the

16   switches were designed to handle expected calling volumes and switches that

17   were designed for greater "usage" could require additional investment.

18

---

[5]   The inherent oddity of this step in the process is sometimes overlooked. Switching "cost models" generally start with a *known* answer – i.e., the price that a manufacturer charges for a particular switch – then attempt to estimate *why* the manufacture established that price. This approach is roughly equivalent to modeling *why* General Motors sells the H2 for $45,000, by using a model that attempts to determine what an H2 *would* cost if it could carry fewer passengers, and then telling your friends your H2 cost $35,000 plus $5,000 a head.

1   Q.   **What is meant by the term "usage" when discussed in the context of**

2   **switching systems?**

3   A.   There are two separate and largely independent measures of "usage." One is the

4   number of times an average user "requests service" (or places a call attempt)

5   during a specified busy period, which is generally referred to as the "busy hour."

6   The other is the total holding time (i.e., "off-hook" time, or time engaged in

7   conversation) sustained by the average subscriber during the busy hour. Each of

8   these usage components affects different parts of the generalized switching

9   system structure. Although the undifferentiated term "usage" is frequently used

10   in its abbreviated form, it is important to appreciate that only busy-hour usage is

11   relevant to switch design.[6]

12

13   Q.   **Please describe the switch control structure.**

14   A.   The control structure is responsible for basic call processing functions, feature

15   processing, maintenance, and other functions. The call processing function

16   includes such responsibilities as detecting and processing call originations and

17   terminations for both trunk and line ports, processing subscriber features,

18   determining routing of interoffice calls, formulating and processing signaling

19   messages for interoffice calls, and controlling the switch fabric.

20

---

[6]   We note that usage outside the busy-hour is immaterial to this discussion because it impacts resources that would otherwise be idle.

1   Q.   **What is the role of the switch fabric?**

2   A.   The switch fabric provides connection paths between ports; it connects lines to

3   lines, lines to trunks, trunks to lines, and trunks to trunks. In a forward-looking

4   switch, the fabric transmits signals in a digital form. The fabric may consist of a

5   time-slot interchange (TSI), a time-multiplexed space switch (TMS), or some

6   combination of both.[7]

7

8   A single-module Lucent 5ESS, for example, includes a TSI as the basic switch

9   fabric. A larger 5ESS consisting of several switching modules contains TSIs in

10   each of the modules (which contain the line and trunk interfaces) and a TMS to

11   interconnect the modules. This architecture is generally known as a T-S-T

12   structure, because it contains "time" switches in the modules serving subscribers

13   and trunks, and a "space" switch (or stage) that then interconnects these modules.[8]

14

---

[7]   A time slot interchange (TSI) "switches" by transferring the information from one time slot in a multiplexed data stream to another time slot in another multiplexed data stream. A space switch "switches" by connecting one physical switch port to another. A time-multiplexed space switch (TMS) connects a specific set of physical switch ports during one time slot interval and then reconfigures itself during the next time slot period to connect different physical ports together. TSIs and TMSs can be combined to provide very flexible switching configurations at very low or zero blocking levels as well as allow the basic switching system architecture to address a wide range of line sizes.

[8]   An *intra*office call between lines terminated on different modules in this architecture would first traverses a time switch in the module serving the originating line, then a "space" switch that interconnects the modules, and then another time switch in the module serving the destination line.

1   **Q.**   **What is a switch's "periphery"?**

2   A.   The "periphery" is the part of the switching system where lines, trunks, and

3   (typically) "service" circuits such as tone generators, digit receivers, and

4   announcement sets are physically connected. These interfaces are usually known

5   generically as "ports." The shelves, or carriers, in which the line, trunk, and other

6   circuit boards are mounted include "backplane" connections to the switching

7   fabric and control structure. These connections allow, for example, the control

8   structure to detect requests for service from port circuits and to invoke control

9   functions such as reading decoded dialed digits from digit receivers, applying and

10   removing ringing voltage from line circuits, etc. Another set of backplane

11   connections provides access to the switch fabric so that the line and trunk

12   interface circuits can be "switched" to other line or trunk appearances.

13   **Q.**   **How do these different functional divisions affect switching system capacity?**

14   A.   The capacity limits of these functional divisions are essentially independent of

15   each other and are usually separately addressed.[9]

16   **Q.**   **What limits the control structure capacity?**

17   A.   The control structure is most heavily involved in a call during the call setup

18   process. Its capacity is thus most strongly affected by call attempts and feature

19   activations; when a call is "stable," that is, when the connection has been

20   established between the calling and called parties, the control structure has

---

[9]   *See, e.g., LSSGR: Traffic Capacity and Environment*, GR-517-CORE, Telcordia
Technologies (formerly Bellcore), Issue 1, December, 1998, ("*LSSGR*"), at 2-1 through 2-3.

1   minimal involvement. The control structure's capacity limit is therefore typically

2   expressed in terms of busy-hour call attempts (under some specified definition of

3   the busy hour) and is often referred to as the switch's "real-time capacity."[10]

4   Holding time (call duration) has little effect on the real-time capacity.

5

6   Q.   **What limits the switch fabric capacity?**

7   A.   The switch fabric is limited by the number of simultaneous connections it can

8   support. Its capacity limit is thus affected by traffic and is usually expressed in

9   traffic terms, either Erlangs or CCS.

10

11   Q.   **How is the switch periphery limited in capacity?**

12   A.   The peripheral (or port) limit is imposed by the physical design of the switch and

13   is often expressed as the maximum number of ports (lines plus trunks) that can be

14   physically connected (or, sometimes, just as the maximum number of lines that

15   can be served).

16

17   Q.   **Has the nature of switching system capacity limits changed over time?**

18   A.   Yes. When stored-program-controlled (SPC) end-office switches were first

19   introduced forty years ago, their effective capacity was generally limited by

---

[10]   The term "real time" derives from the fact that switch control structure operate under what amount to "real time" operating systems in which certain control functions must be activated and completed within specified time boundaries. When the control structure effectively runs out of time to complete its required tasks, it is said to have exhausted its available "real time."

1   processor performance. The processor and memory technology used in the early

2   SPC switches was very "slow" by today's standards. As digital technology

3   improved over the years since the first introduction of the Number 1 ESS in 1962,

4   switch processor performance has gradually improved to the point where it no

5   longer limits the effective capacity of forward-looking switching systems. The

6   components used to construct switch processors have benefited from the same

7   profound improvements in microprocessor performance and architecture that have

8   vastly improved the performance of personal computers over the past several

9   years.

10

11   Q.   **Can you provide an example of improvements in switch processor**

12   **performance over time?**

13   A.   Yes. When the 5ESS was introduced in 1982, it had a processor capacity of about

14   100,000 busy-hour call attempts.[11] Improvements in component technology and

15   in the overall architecture of the switch's processor complex improved

16   performance to 1,500,000 call completions per hour in 1998, and further

17   improvements to increase the capacity beyond 2,500,000 call attempts per hour

18   were reported that year.[12]

_____

[11]   Lucent uses "busy hour call completions" instead of "busy hour call attempts" as a
measure of processor real-time capacity. This arguably is a more conservative statement of
capacity.

[12]   Richard Singer, Lucent Technologies, "Overview of 5ESS®-2000 Switch Performance,"
Workshop on Software and Performance (WOSP98), Santa Fe, New Mexico, October 12-16,
1998, p 9.

1   Q.   **How does this increase in processor capacity compare to subscriber calling**

2   **behavior?**

3   A.   Subscribers typically attempt about three to four calls in the busy hour.[13] In a

4   forward-looking switch serving 100,000 such subscribers, the total busy-hour

5   calling rate is therefore 300,000 to about 400,000 busy-hour attempts, which is

6   well under half the real-time capacity of, say, a 5ESS as described above. Even

7   with a very high, if not extreme, *average* calling rate of eight busy-hour call

8   attempts per line, the switch could still handle those 800,000 calls per hour, which

9   is just over *half* the capacity of the 5ESS control complex as stated over four

10   years ago. Typical subscriber calling behavior thus does not begin to approach

11   forward-looking processor capacity limits, even on very large switches.

12

13 Q.   **Do other switch manufacturers state similar performance figures?**

14 A.   Yes. Obviously, as one would expect, switches offered by competing vendors for

15   similar applications will exhibit similar performance characteristics. Nortel, for

16   example, advertised in 1999 a real-time capacity for its XA-Core processor, used

17   in the DSM-100 and DMS family switches, of greater than 1.3 million busy-hour

18   call attempts.[14]

19

---

[13]   *LSSGR*, p 6-8. These values pertain to average busy season busy hour (ABSBH).

[14]   Nortel Networks Product Brief, "DMS SuperNode System XA-Core," 50250.02/12-99,
        1999.

1   Q.   **Does the fabric of a forward-looking switching system limit the practical**

2   **capacity of the switch?**

3   A.   No. In fact, the switch fabric has generally never been the component limiting the

4   performance of a switch. Switch fabric capacity is relatively inexpensive and, as

5   a result, switch developers have designed switches with much greater traffic

6   capacity than that required by subscribers. This fact simplifies the engineering of

7   switches for specific installations.

8

9   Q.   **What is the implication of the above to the fundamental cost-model**

10   **"assumption" that usage is a binding constraint (and, as a result, investment**

11   **costs should be allocated based on usage)?**

12   A.   Today, forward-looking switches are generally considered "nonblocking" or

13   "essentially nonblocking." A "nonblocking" switch fabric design effectively

14   guarantees that any port can be switched, or can be assigned a "talking path,"

15   regardless of the state of any of the rest of the ports on the switch. Thus, the

16   probability that a talking path will not exist for a given port (the "blocking"

17   probability) is zero. In an "essentially nonblocking network," the blocking

18   probability is generally a small fraction of one percent, say, one ten-thousandth of

19   one percent or less.

1   Q.   Then what constitutes the practical capacity limit of a forward-looking

2   switch?

3   A.   Because neither processor usage nor switch fabric usage limits the performance of

4   a forward-looking switch, the practical switch capacity is imposed by the

5   maximum number of lines that a carrier is comfortable serving from a single

6   switch. As one ILEC made clear:

7   Modern digital switches are designed to be port-limited. That is,
8   enough switch fabric and processor capability is provided so that
9   the normal peak call usage from the anticipated number of working
10   ports, of all types on the switch, can be served within acceptable
11   blocking criteria .... Put another way, there are enough usage-
12   sensitive switch resources (but no more than are necessary) to
13   handle all the minutes of use that the ports are forecasted to deliver
14   in the normal peak period.[15]

15

16   Q.   In a forward-looking switch, do realistic subscriber usage characteristics

17   have any bearing on the overall capacity of the switch?

18   A.   No. Forward-looking switches contain very robust control and switch fabric

19   capacities that are not exhausted by realistic subscriber usage.[16] These switches

---

[15]   Testimony of J. Gansert, NYNEX, New York Case 95-C-0657, 94-C-0095 and 91-C-1174 consolidated, page 24.

[16]   There are certain minor switch components, such as digit receivers, that are "engineered" according to certain design rules to serve expected demand. These devices, however, are relatively inexpensive and can easily be added to the switch if increased demand requires it. A shortage of digit receivers, for example, can lead to increased dial-tone delay. This is easily remedied by equipping more such components. Any usage cost attributable to such components is minuscule and would not warrant the additional investment required in tracking and billing the usage of such inexpensive components. Other types of service circuits, such as conference circuits, also are "engineered." In the specific case of a conference circuit, any corresponding usage cost will again be very small and will normally be recovered through separate charges to the subscriber electing conference services (such as "three-way calling").

1   are limited in size only by the maximum *number of subscribers* (or lines), and not

2   the behavior of those subscribers, that carriers choose to serve by a single

3   switching system.

4

5   Q.   **Is it still necessary for service providers to "engineer" forward-looking**

6   **switches?**

7   A.   Yes. For reasons unrelated to busy-hour usage, an ILEC will not install switches

8   with maximum capacity in all wire centers. Although a modern switch may

9   physically be able to support well over 100,000 subscriber lines, carriers usually

10   to not serve that many lines on one switch. Even though telephone switching

11   systems are usually designed with fully-redundant control structures and switch

12   fabrics and large-scale failures are rare, they can still occur, and carriers correctly

13   avoid exposing more than several tens of thousands of users to a potential full-

14   office outage.

15

16   The actual traffic load on the switch, however, is less relevant. The processing

17   and switching capacities of forward-looking switches are such that even heavy

18   subscriber usage will generally not exhaust them even at maximum practical line

19   sizes. Subscriber traffic behavior has been exhaustively analyzed and thoroughly

20   characterized for many decades, and an ILEC will use well-established

21   procedures to install suitably-sized switches to serve specific local demand. The

1   principal point here is that the real-time and traffic capacity of such switches will

2   not be approached by subscriber demand.

3

4   IV.   **IMPLICATIONS FOR THE PRICING OF THE UNBUNDLED LOCAL**
5   **SWITCHING NETWORK ELEMENT**

6   Q.   **What does the above discussion mean for the appropriate rate structure of**

7   **the unbundled local switching network element?**

8   A.   It is important that entrants pay prices to *lease* unbundled local switching that

9   parallel, as closely as possible, the manner in which the *cost* is incurred. As

10   explained above, the historic rationale to impose usage charges for switching no

11   longer exist. Moreover, as Qwest's switch-purchase contracts have become

12   available for review in a number of cost proceedings across its region, it is clear

13   that Qwest does not pay for its switches through a usage rate.

14

15   If a flat-rate structure is good enough for the company *selling* the switch, and it is

16   good enough for the company *buying* the switch, how can it not be good enough

17   for a CLEC *leasing* it? In order for CLECs to pay a cost-based rate for local

18   switching, the appropriate rate structure should recover this cost through a flat-

19   rate per switch port.

20

21 Q.   **Is the switching rate structure issue competitively significant?**

22 A.   Yes. This is no small debate – the rate structure Qwest recommends would

23   impose on CLECs a cash-outlay, for each and every minute, of each and every

1   call, that their customers make, even though Qwest would incur no such cost.

2   This would create very different cost-implications for CLECs than Qwest for calls

3   that are identical, introducing a serious distortion to the market. This is

4   particularly critical in a local market where the dominant provider (Qwest) offers

5   flat-rate service and the market is moving towards *more* flat-rate offerings.[17]

6   Moreover, it is generally the residential customer that has a higher usage per line.

7   In such an environment it is absolutely critical that CLECs not be penalized

8   through a contrived usage rate for local switching. Usage-sensitive pricing of

9   unbundled local switching is not only not justified, it acts as a deterrent to

10   residential competition.

11

12   **Q.**   **Does Qwest purchase switches by paying manufactures a "usage rate"?**

13   A.   No. In other states where Qwest vendor contracts have been evaluated, that

14   review demonstrates that Qwest purchases switching by paying a flat rate, albeit a

15   flat-rate that may nominally increase as the capability of the switch increases.[18]

---

[17]   For instance, consider the recently announced MCI Neighborhood, which even eliminates usage pricing of long distance service. These types of pricing plans are being very well received by customers, and will likely become the competitive-norm in short order.

[18]   SBC-Ameritech has also confirmed that switching costs are invariant to usage at or below design-levels. (*See* Direct Testimony of William Palmer, ICC Docket 96-0486, Ameritech-Illinois Exhibit 3.3). Moreover, SBC-Ameritech clearly purchases switching capacity on a per-line basis:

> By the terms of the [switch vendor] contracts, Ameritech buys switching equipment by paying a one-time price for each line that it demands. The line prices do not vary with the number of lines purchased, or with the year of purchase, nor with the state in which the equipment is to be installed; the contracts are region-wide.

1   The fact that Qwest's pays more (on a flat rate basis) for a switch with more

2   capability than another switch, however, is not a reasonable basis to impose a

3   usage cost on CLECs sharing those *same* switches each and every time their

4   subscriber makes (or receives) a call.

5

6   Q.   **Doesn't a variation in per line prices in Qwest's switching contracts**

7   **according to the level of usage engineered in the switch indicate that**

8   **switching costs are incurred on a usage sensitive basis?**

9   A.   No. Qwest made that argument in proceedings before the Minnesota and Utah

10   Commissions, and it fundamentally misses the point. Switches, like other

11   equipment or facilities, are constructed to have a certain capacity. Not

12   surprisingly, switches with greater capacity cost more on a per line basis than

13   switches with less capacity. The same, however, is true of loop plant and other

14   facilities. DS3 circuits, for example, have a greater capacity and are more costly

15   than DS1 circuits, but that does not mean that loops are usage sensitive simply

16   because they are engineered to have different capacity. A variation in costs based

17   on the level of capacity does not justify charging a usage sensitive rate – it would

18   only affect the level of the appropriate flat charge per port.[19]

Ameritech Ohio Exhibit 2.4, page 1, Public Utility Commission of Ohio, Case No. 96-922-TP-UNC.

[19]   We note, moreover, that even if "busy-hour" usage may have influenced initial switch design, that would never justify a non-differentiated usage rate that applied to every minute, at all times of the day. As we explain, there is no reason to adopt any usage rate, while Qwest's response (at most) would only justify a rate applicable to peak usage at the busy hour. The rate structure Qwest recommends, even under its own cost-theory, however, would misprice usage 23

1   Q.   But if usage of an existing switch increases, doesn't Qwest incur greater costs

2   to increase switch capacity?

3   A.   No. As we previously discussed, modern switches are engineered with capacity

4   far above that required to serve well-characterized per-subscriber usage. The only

5   legitimate capacity limitation is the number of lines served by the switch, which

6   reflects the number of telephone subscribers, not the extent to which those

7   subscribers use the switch.

8

9   Q.   Don't Qwest's switch contracts also include charges for trunks in addition to

10   per line prices for the switch?

11 A.   Yes, but again, that fact does not mean that switching costs in general are usage

12   sensitive. Qwest's vendors charge Qwest the vast majority of Qwest's switching

13   costs on a per line basis. Trunks are the portals for connections between switches,

14   which permit customers served by one switch to make calls to customers served

15   by a different switch. Qwest engineers its network to ensure that the ratio

16   between the lines and the trunks served by a switch are sufficient to accommodate

17   all inter-switch calls. Thus, it is quite simple to include expected trunk costs in

18   the per-line charge that we recommend. Moreover, where Qwest does augment

19   trunks, that action is driven primarily by the need to interconnect with other

20   carriers, including CLECs, long distance carriers, and wireless carriers, and Qwest

hours out of the day. While we do not believe that a time-of-day rate structure is appropriate, it is useful to note that Qwest never recommends the rate structure that matches its own cost-theory.

1   is separately compensated for such interconnection. Qwest seldom must augment

2   trunk capacity to accommodate inter-switch calls between its own customers, and

3   even then, such costs are insignificant compared with Qwest's other switching

4   costs.

5

6   Q.   **Might not CLEC customers have higher usage levels than current Qwest**

7   **customers, increasing the demand on (and correspondingly the cost of)**

8   **Qwest's switches?**

9   A.   No. This is yet another red herring that Qwest has raised in other states. First, as

10   discussed above, modern switches are engineered to accommodate more usage

11   than any subscribers – CLEC or Qwest – are reasonably likely to have.

12

13   Second, there is no reason to expect (a priori) that the usage profile – particularly

14   the *peak* usage profile – of a CLEC's subscribers served using unbundled local

15   switching would systematically differ from the usage profile of Qwest's

16   customers served by that switch. Unbundled local is principally used by CLECs

17   to compete for mass-market customers – the exact *same* customers that are served

18   by these switches today.[20] Thus, the design limits of the local switch are unlikely

19   to be more affected by individual CLECs (or their customers) than they are by

20   Qwest.

---

[20]   A primary reason that CLECs use unbundled local switching is because it offers the same
footprint as the incumbent and permits for customer migrations without manual reconfiguration to
alternative switching facilities. Consequently, there would be no reason for a CLEC to serve
different customers than the incumbent serves using unbundled local switching.

1

2   Because CLECs will be serving the same customers that are served by the switch

3   today, each CLECs' expected contribution to peak demand should correlate

4   closely with the proportion of the lines that it serves. Consequently, a per-line

5   charge on CLECs should approximate a CLEC's proportional responsibility to

6   peak usage at least as well as the CLEC's total usage.

7

8   Q.   **Has Qwest itself acknowledged the fact that forward-looking switches are in**

9   **fact not usage-sensitive?**

10 A.   Yes. Qwest witness Paul McDaniel stated the following in a filing at the

11   Colorado Public Utilities Commission in October, 2002:

12   The nature of switching costs has changed significantly
13   over time with advances in digital technology. Switching
14   costs today are more line-driven than traffic-sensitive. It is
15   not unreasonable to model switching costs now as
16   depending entirely on the number of line-side ports and the
17   number of trunk-side ports. Switching costs in such a
18   model can be reasonably recovered entirely as fixed
19   monthly charges.[21]
20

---

[21]   Direct Testimony of Paul R. McDaniel, "IN THE MATTER OF THE JOINT
APPLICATION FOR APPROVAL OF A PLAN TO RESTRUCTURE REGULATED
INTRASTATE SWITCHED ACCESS RATES AND PETITION FOR A COMMISSION
ORDER DECLARING THE PLAN TO BE APPLICABLE TO ALL LOCAL EXCHANGE
CARRIERS IN COLORADO," October 4, 2002, at p 19. Furthermore, Mr. McDaniel's
testimony contains the following footnote: "From the perspective of a carrier or large end user,
however, the costs may be traffic sensitive because additional traffic may require the use of more
trunks or lines, respectively." Mr. McDaniel's "clarification," however, underscores our position
by demonstrating the relationship between end-user lines and usage.

1   Moreover, Qwest witness Harry M. Shooshan III used precisely the same

2   language in testimony before the Arizona Commission in July, 2002.[22] Finally,

3   we would note that Qwest generally opposes the deaveraging of local switching

4   prices, noting "switching costs do not vary in any significant way between

5   zones."[23] Of course, given the fact that switch usage would vary, the only reason

6   that costs would not vary would be the fact that switching costs are not sensitive

7   to usage.

8

9   **Q.**   **Have other states concluded that the ULS network element should be flat-**

10   **rated?**

11   **A.**   Yes. Minnesota and Utah, states in which Qwest is the incumbent local provider

12   have ruled on the issue and both have adopted flat-rated UNE local switching.[24]

13   Outside the Qwest region, the Illinois Commission also conducted an extensive

14   examination of the cost-justification for usage charges associated with the ULS

15   network element. At the conclusion of that proceeding, the Illinois Commission

16   rejected Ameritech-Illinois' proposal to impose a usage charge:

17   Because Ameritech incurs switching costs on a predominantly per-
18   line [i.e., per line-port] basis, we find it consistent with the

---

[22]   The Investigation of the Cost of Telecommunications Access, Docket Number T-00000D-00-0672, page 25.

[23]   *See*, for instance, Brigham Direct Testimony, DOCKET NO. 01-049-85, Utah Public Service Commission, page 27.

[24]   *Order Setting Prices and Establishing Procedural Schedule*, MPUC Docket Nos. P-421/CI-01-1375, *et al.* (October 2, 2002). *Report and Order*, Utah PSC Docket No. 01-049-85 (May 5, 2003).

1   fundamental principles of cost causation that the ULS subscriber
2   should also pay the ULS element primarily on a per line basis.[25]
3

4   More recently, the Illinois Commission again rejected SBC-Ameritech's efforts to

5   impose a usage sensitive rate, finding that:

6   Our extensive investigation of Ameritech's ULS cost structure
7   conclusively demonstrated that Ameritech's switch costs are not
8   usage sensitive, and Ameritech's attempt to unilaterally reclassify
9   the local switch as usage sensitive is a blatant violation of our
10   TELRIC Order.[26]
11
12 In addition, the Wisconsin Commission has voted to adopt a flat rate for the

13 unbundled local switching element, recognizing that it is more cost-based,[27] as

14 well as the Indiana Commission.[28]

15

16 Q. **But haven't AT&T and MCI previously advocated usage sensitive pricing for**

17   **UNE local switching?**

18 A. Yes, that is our understanding. However, as we noted above, the usage based

19   pricing of unbundled local switching is an industry *practice* whose justification

20   has disappeared with advances in technology and as the regulatory focus has

21   shifted from "retail service" to the "wholesale network element" at issue here.

22   The fact that it took some time for this change to occur within AT&T and MCI is

---

[25]   *Second Interim Order*, ICC Docket 96-0486 and 96-0569 Consolidated, Illinois
Commerce Commission, February 17, 1998, page 59.

[26]   Order, Illinois Commerce Commission Docket 98-0396, page 68.

[27]   Open Meeting, December 13, 2001, Docket 6720-TI-161.

[28]   Order, Cause No. 40611-S1, Phase I, March 28, 2002, page 42.

1   regrettable, but understandable (given the size of the organizations). As we

2   explained above, prior efforts at determining the appropriate "allocation" of

3   switch investment between fixed and usage charges has been difficult precisely

4   because it sought the answer to a question that made no sense. The very exercise

5   of trying to determine the "percentage" of switch investment that should be

6   "allocated" to usage led to different and shifting answers over time because the

7   exercise was inherently arbitrary.[29] All new ideas start as *new* ideas, and we

8   recommend that this idea be judged on the merits as we have explained them.

9   The Commission should adopt a flat-rate structure for unbundled local switching

10   in this phase of the proceeding.

11

12   **Q.   Does this conclude your testimony?**

13   A.   Yes.

---

[29]   In a sense, efforts to divine the usage-sensitive component of unbundled local switching was akin to trying to find a black cat in a dark room under circumstances where *there was no cat*.